# EXHIBIT P

**UNITED STATES DISTRICT COURT**
**FOR THE EASTERN DISTRICT OF TEXAS**
**MARSHALL DIVISION**

| | |
|---|---|
| ENTROPIC COMMUNICATIONS, LLC,<br><br>Plaintiff<br><br>v.<br><br>CHARTER COMMUNICATIONS, INC.,<br><br>Defendant. | Civil Action No. 2:22-cv-00125-JRG |

**OPENING EXPERT REPORT OF STEVEN H. GOLDBERG REGARDING INVALIDITY OF U.S. PATENT NOS. 8,223,775; 8,284,690; 8,792,008; 9,210,362; 9,825,826; AND 10,135,682**

#### 4. Claim 7

355. In my opinion, this claim is invalid due to lack of both enablement and written description for the additional reasons that the specification does not disclose or enable "said characteristics is signal phase vs. frequency."

#### 5. Claim 8

356. In my opinion, this claim is invalid due to lack of both enablement and written description for the additional reasons that the specification does not disclose or enable "said characteristic is" "peak-to-average ratio," "noise levels," "bit error rate," or "symbol error rate."

### i. Objective Indicia of Non-Obviousness Regarding the '008 and '826 Patents

357. I am unaware of any objective indicia that would counter the obviousness analysis with respect to the '008 and '826 Patents that I provided above. I understand that Charter has requested Entropic's positions regarding secondary considerations and objective indicia, to which Entropic did not provide any response. To the extent Entropic provides additional information regarding the claims of the '008 and '826 Patents, I reserve the right to amend my opinions in response.

## XII. The '362 PATENT

### a. Background and Admitted Prior Art

358. U.S. Patent No. 9,210,362 (ENTROPIC_CHARTER_0000549 – 0000567) (the "'362 Patent") purports to solve problems with conventional wideband tuners, such as the tuner depicted in FIG. 1:

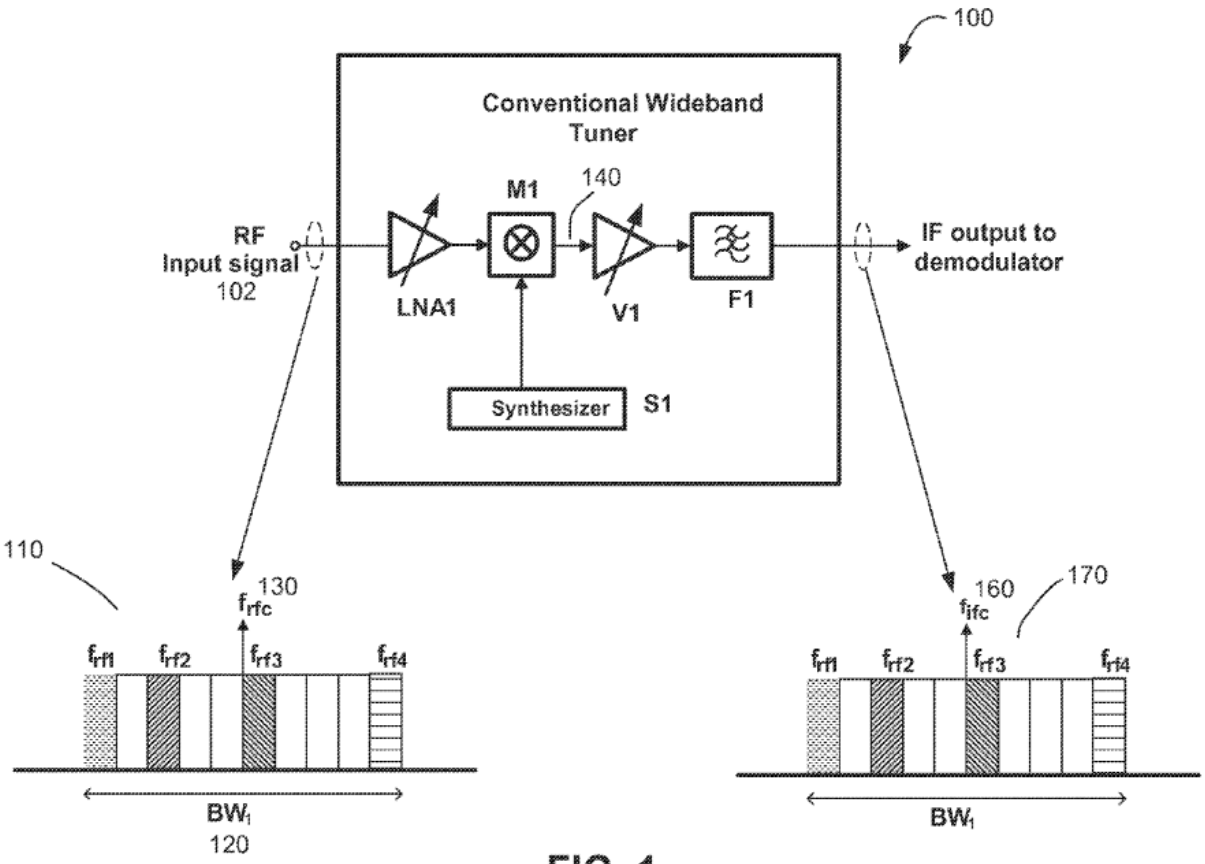


FIG. 1
(Prior Art)

359. According to the '362 Patent, such conventional tuners receive an RF signal "including multiple desired channels that are located in non-contiguous portions of a radio frequency spectrum." '362 Patent, 1:65-67. For example, as shown in in FIG. 1, a "swath of channels 110 occupies a bandwidth BW1 120 at an RF center frequency $f_{rfc}$ 130." *Id.*, 1:67-2:2. Meanwhile, "[s]ynthesizer S1 may be tuned to a frequency around the center frequency $f_{rfc}$ 130 for mixing channels 110 to an intermediate frequency $f_{ifc}$ 160." *Id.*, 2:2-4. The frequency down-mixed channels are then amplified and filtered "to produce a swath of channels 170 centered around frequency $f_{ifc}$ 160." *Id.*, 2:4-6. As shown in FIG. 1, the bandwidth BW1 contains 10 channels which, if they are TV channels, are normally spaced at either 6 MHz or 8 MHz, meaning that

bandwidth BW1 120 would span from 60-80 MHz, and, as a result, the down-converted bandwidth at the intermediate frequency would also require a bandwidth equal to at least BW1. *Id.*, 2:8-13.

360. The '362 Patent observes that when "desired" RF channels are located both in the lower portion of the frequency band (such as VHF in terrestrial TV broadcasting or CATV) and in the higher portion of the frequency band (such as UHF in terrestrial TV broadcasting or channels in CATV's "ultra band"), the total bandwidth BW1 can be 800 MHz or higher. *Id.*, 2:14-20. According to the '362 Patent, this is problematic because the "wide bandwidth of 800 MHz would require a very expensive digital processing circuitry such as very high-speed analog to digital conversion and high-speed processor in the demodulator." *Id.*, 2:20-23. It is desirable to have wideband receiver systems that can increase the dynamic range without requiring expensive data conversion, filtering and channel selection at the demodulator.

**b. Summary of the Alleged Invention of the '362 Patent**

361. The '362 Patent purports to solve the above issues with conventional wideband tuners by disclosing "wideband receiver systems that can increase the dynamic range without requiring expensive data conversion, filtering and channel selection at the demodulator." *Id.*, 2:24-27.

362. The '362 patent allegedly achieves this result via "a wideband receiver system that is configured to concurrently receive multiple radio frequency (RF) channels including a number of desired channels that are located in non-contiguous portions of a frequency spectrum and group the desired channels in a contiguous or substantially-contiguous frequency band at an intermediate frequency spectrum, where the term 'substantially-contiguous' includes spacing the desired channels close to each other (e.g. as a fraction of the total system bandwidth, or relative to a channel bandwidth) but with a spacing that can be variable to accommodate the needs of overall system." *Id.*, 2:31-42.

59. I note that the '362 Patent does not define what a wideband analog-to-digital converter (ADC) module is. However, in my opinion, Zhang's ADC 220, by virtue of it being a "high-speed ADC" having the ability to convert the entire signal band with all n channels, ADC 220 meets the requirement of a "wideband" ADC module.

398. As I discussed in Section XII.g.i.3, the RF signal received by Zhang's demodulator contains both "desired" and "undesired" television channels. As a result, ADC 220 digitizes both the desired and undesired television channels present in the received RF signal.

399. Therefore, in my opinion, Zhang discloses or suggests this limitation.

**5. [11a3]: "selecting, by digital circuitry of said wideband receiver system, said plurality of desired television channels from said digitized plurality of frequencies; and"**

400. In my opinion, Zhang discloses or suggests this limitation.

401. For example, as highlighted below in annotated FIG. 2, Zhang discloses both a digital channel demultiplexer and what Zhang refers to as an nxm digital selector.

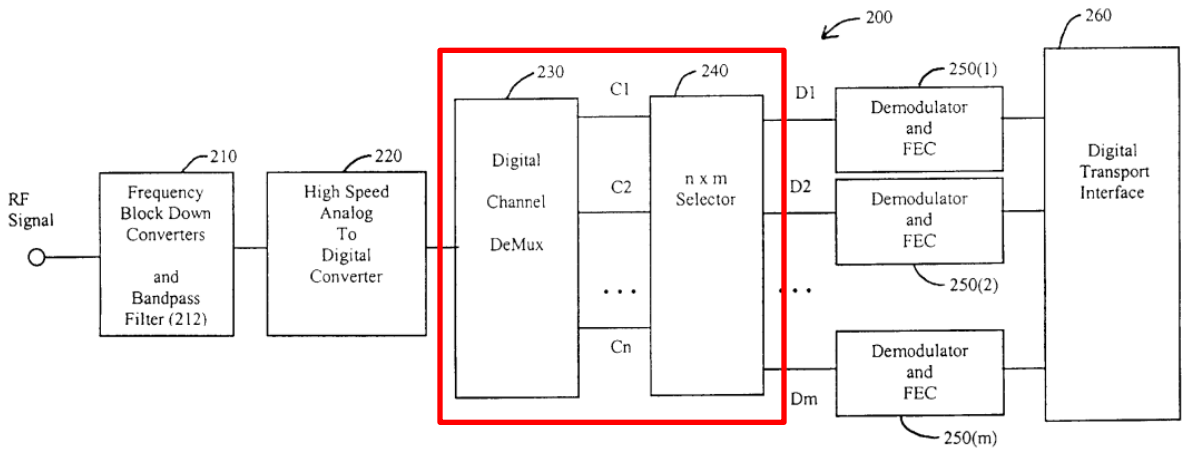


Fig. 2

402. According to Zhang:

> A ***digital channel demultiplexer 230*** then ***demultiplexes the multi-channel digital RF signal into separate digital RF channels*** $C_1$ to $C_n$. The specific implementation of channel demultiplexer 230 will depend on the specific application and

> requirements. Alternative channel demultiplexer embodiments are described in more detail below (FIGS. 2 and 3). Still referring to FIG. 2, ***an n×m digital selector 240 receives the demultiplexed digital RF channels $C_1$ to $C_n$ and then selects one or more of the RF channels $D_1$ to $D_m$ from one or more of the digital RF channels $C_1$ to $C_n$***. RF channels $C_1$ to $C_n$ contain content channels that are selected or used by a subscriber. Channel-search capabilities of the digital selector 240 renders it much faster than traditional analog channel switching through RF tuners. This is because o***nly the selected channels are later demodulated unlike the systems using RF tuners which demodulate all of the RF channels***.

*Id.*, 3:60-4:9. The '362 Patent does not define the term "digital circuitry." In my opinion, however, Zhang's digital channel demultiplexer 230 and digital selector 240 are each "digital circuitry."

403. Zhang, for example, discloses a "digital tuner 300," which can be used to implement digital channel demultiplexer 230. *Id.*, 4:33-36. Zhang goes on to refer to digital tuner 300 as "[d]igital tuner ***circuit*** 300," which "outputs the separated RF channels $C_1$ to Cn, each RF channel being centered at baseband." *Id.*, 4:65-67.

404. Zhang discloses another embodiment of digital channel demultiplexer 230, which, in this case, is a "polyphase channel demultiplexer 400." *Id.*, 5:1-2. Zhang goes on to discloses that "[p]olyphase channel demultiplexer 400 includes a bank of low-pass filters (LPFs) 410(1 . . . n) and a ***discrete Fourier transform circuit*** (DFT) 420." *Id.*, 5:5-7.

405. With respect to digital selector 240, in my opinion, Zhang confirms (aside from its name) that it is implemented using digital circuitry. Indeed, Zhang contrasts digital selector 240 with "traditional" analog circuitry. *See, e.g., id.*, 4:4-6 ("Channel-search capabilities of the digital selector 240 renders it much faster than traditional analog channel switching through RF tuners.").

406. As demonstrated by the above quoted passage, Zhang discloses that digital channel demultiplexer 230 and digital selector 240 select desired television channels from a multi-channel digital RF signal. Zhang discloses:

> Still referring to FIG. 2, an n×m digital selector 240 receives the demultiplexed digital RF channels $C_1$ to $C_n$ and then ***selects one or more of the RF channels $D_1$ to $D_m$ from one or more of the digital RF channels $C_1$ to $C_n$***. RF channels $C_1$ to $C_n$ contain content channels that are selected or used by a subscriber. Channel-search capabilities of the digital selector 240 renders it much faster than traditional analog channel switching through RF tuners. ***This is because only the selected channels are later demodulated unlike the systems using RF tuners which demodulate all of the RF channels***.

*Id.*, 3:66-4:9.

407. Therefore, in my opinion, Zhang discloses or suggests this limitation.

**6. [11a4]: "outputting, by said digital circuitry of said wideband receiver system, said selected plurality of television channels to a demodulator as a digital datastream."**

408. In my opinion, Zhang discloses or suggests this feature.

409. For example, still referring to FIG. 2, Zhang discloses:

> ***The m selected RF channels are then fed into respective demodulators 250(1), 250(2), . . . 250(m)***. The architecture of demodulator 200 enables it to handle multi-channel satellite, terrestrial TV (NTSC, ATSC, DVB-T, etc), and cable downstream signals. In some embodiments ***demodulators 250(1 . . . m) are shared demodulators because they share resources. Many functional blocks can be shared between different demodulators***. Such functional blocks, for example, can include numeric controlled oscillators (NCOs), timing error detection circuitry, carrier recover circuitry, etc. Because of the resource sharing between such demodulators, significant power saving is achieved. Hence, with such embodiments of the present invention, more RF channels can be demodulated in a single chip.

*Id.*, 4:13-26.

written description of the '682 Patent and fails to enable a POSITA to practice the full scope of the claim.

**j. Objective Indicia of Non-Obviousness Regarding the '682 Patent**

578. I am unaware of any objective indicia that would counter the obviousness analysis with respect to the '682 Patent that I provided above. I understand that Charter has requested Entropic's positions regarding secondary considerations and objective indicia, to which Entropic did not provide a substantive, non-conclusory response. To the extent Entropic provides additional information regarding the claims of the '682 Patent, I reserve the right to amend my opinions in response.

## XIV. CONCLUSION

579. For the reasons stated herein, it is my opinion that each and every patent asserted against Charter in this litigation is invalid. I reserve the right to respond to any evidence (including expert opinions) that Entropic may offer in response to my opinions.

Steven H. Goldberg, Ph.D. (E.E.)